Fisheries and Oceans Canada | Pêches et Océans Canada

Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2016/012

2015 MARITIMES WINTER RESEARCH VESSEL SURVEY TRENDS ON GEORGES BANK

Context

Fisheries and Oceans Canada (DFO) has conducted winter research vessel (RV) surveys in the Maritimes Region, Northwest Atlantic Fisheries Organization (NAFO) Area 5Z (Georges Bank) using a standardized protocol since 1987. Results from these surveys provide information on trends in abundance for groundfish species in the Maritimes Region. While these data reflect trends in biomass and abundance and are a critical part of science-based stock assessments, a full assessment, including other sources of data, would be required to evaluate the impacts of management measures on population status. Fisheries and Aquaculture Management (FAM) requested a review of the DFO Winter RV Survey information on the following species in 5Z1-5Z4 (Figure 2) from the 2015 Winter RV Survey on Georges Bank: Cod, Haddock, Pollock, White Hake, Smooth Skate, Thorny Skate, Barndoor Skate, Winter Skate, and Little Skate. The survey information will be used by FAM as background for discussions with various industry stakeholders on recommendations for management measures, and to determine which stocks should be reviewed in more detail in 2016.

This Science Response Report results from the Science Response Process of November 30, 2015, 2015 Maritimes Research Vessel Survey Trends on Georges Bank.

Background

The Georges Bank (5Z) Winter RV Survey has been conducted annually in NAFO Area 5Z (Georges Bank, Figure 1) using a standard stratification since 1987. The survey follows a stratified random sampling design, and it includes sampling of fish and invertebrates using a bottom otter trawl. These surveys are the primary data source for monitoring trends in species distribution, abundance, and biological condition on Georges Bank (for details see Stone and Gross 2012). The bottom trawl surveys were designed to provide abundance trends for fish and invertebrates between depths of about 30 m and 200 m. Survey indices are expected to be proportional to abundance for most species.

Strata boundaries are shown in Figure 2 for the 5Z area. Sampling is generally conducted between mid-February and mid-March with 103 stations allocated within strata 5Z1 – 5Z9. In 2015, sampling was only conducted in strata 5Z1-5Z4 and 5Z9. Mechanical problems with the vessel delayed the start of the survey by 4 weeks. There were 51 fishing stations completed between March 14th and March 27th. This is only the second time the survey has been completed later than March 20th. Catch distribution plots for the area sampled are provided for the suite of species requested.

Canada

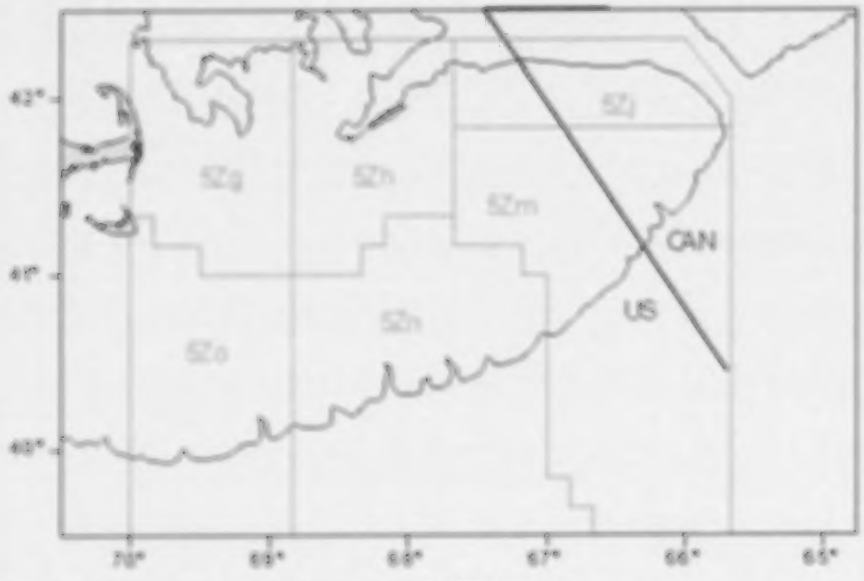


Figure 1. Northwest Atlantic Fisheries Organization (NAFO) Unit Areas.

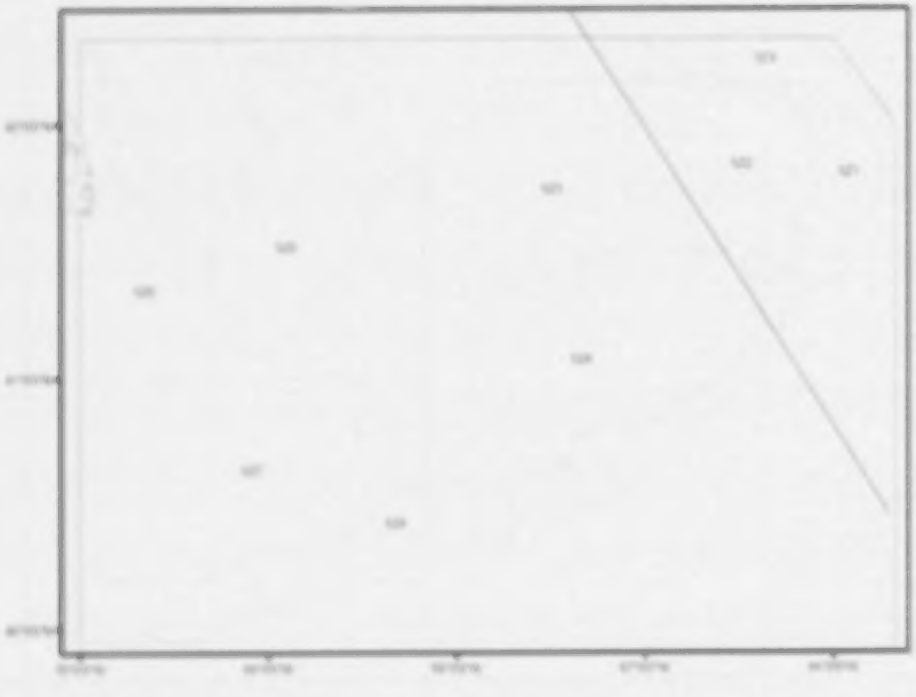


Figure 2. Georges Bank (5Z) Winter Research Vessel Survey strata.

Analysis

The time-series of survey biomass indices (not total biomass) are compared to averages for a series of time periods to provide historical context for biomass levels (Table 1). The time periods used are a short-term 5 year average (2010-2014) and the long-term survey average (1987–2014). Information on calculation of these indices is contained in Stone and Gross (2012).

Biomass index trends are shown for 5Z1–5Z4 only. Comparisons of 2014 and 2015 length frequencies from the survey catch to the long-term median or mean (1987-2013) are also included for the selected stocks. Comparisons with the median are used to lessen the impact of high values in one year, which can result in all other years being below average. Comparisons to the mean are used for species where the numbers caught are so low that the median number at length is often zero.

Table 1. Research Vessel survey biomass indices (tonnes) by species for 2013, 2014, 2015 and averages for long-term (1987-2014) and short-term 5 year (2010-2014) time periods.

Stock/Region	2013	2014	2015	1987-2014 Avg	2010-2014 Avg
Cod	10841	2373	3652	17227	12961
Haddock	145783	74591	261538	58026	89262
Pollock	444	166	1591	5530	2925
White Hake	206	8	0	101	108
Smooth Skate	17	0	5	10	13
Thorny Skate	30	0	45	165	57
Barndoor Skate	127	35	83	161	248
Winter Skate	7634	7774	5554	13725	9658
Little Skate	8797	16600	3407	7430	7071

Atlantic Cod

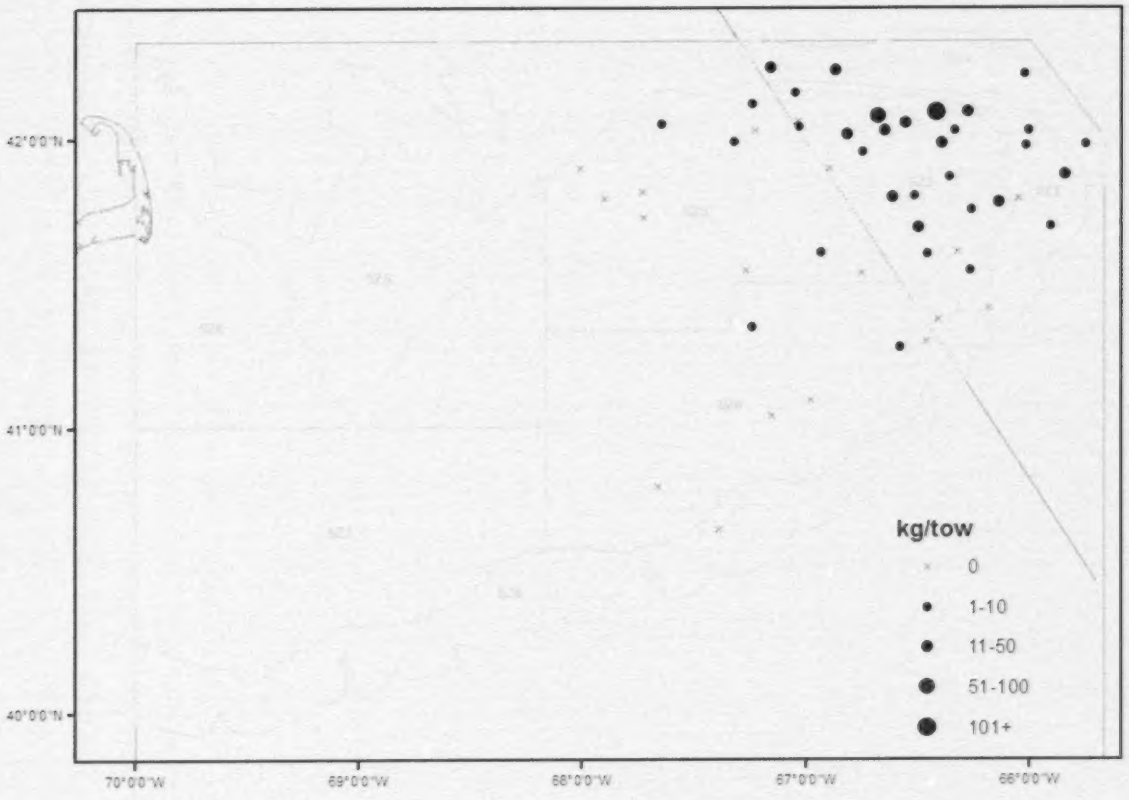


Figure 3a. Distribution of Atlantic Cod catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportional to the catch size.

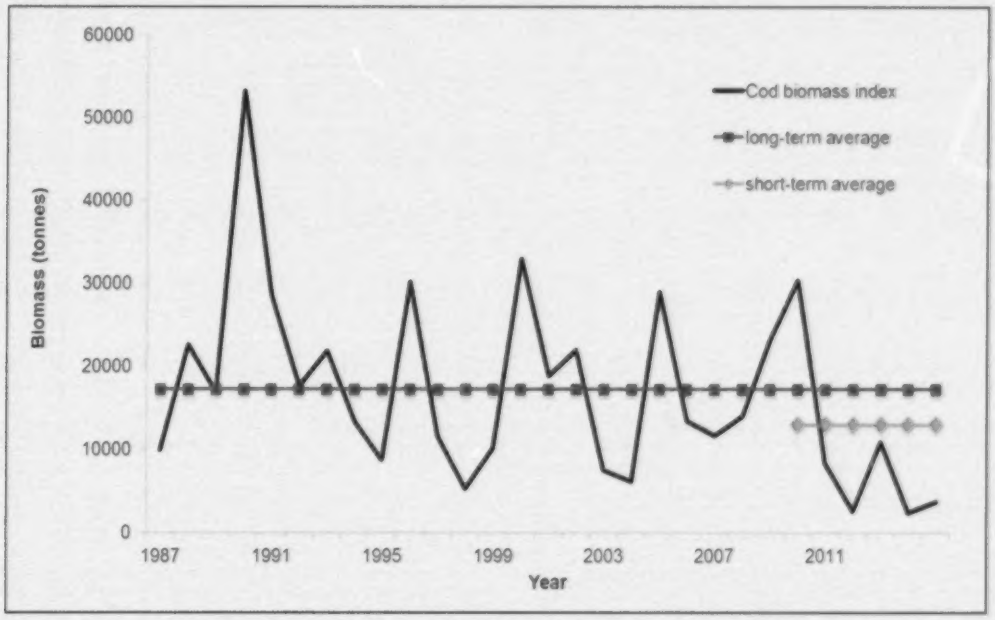


Figure 3b. Biomass index for Atlantic Cod in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

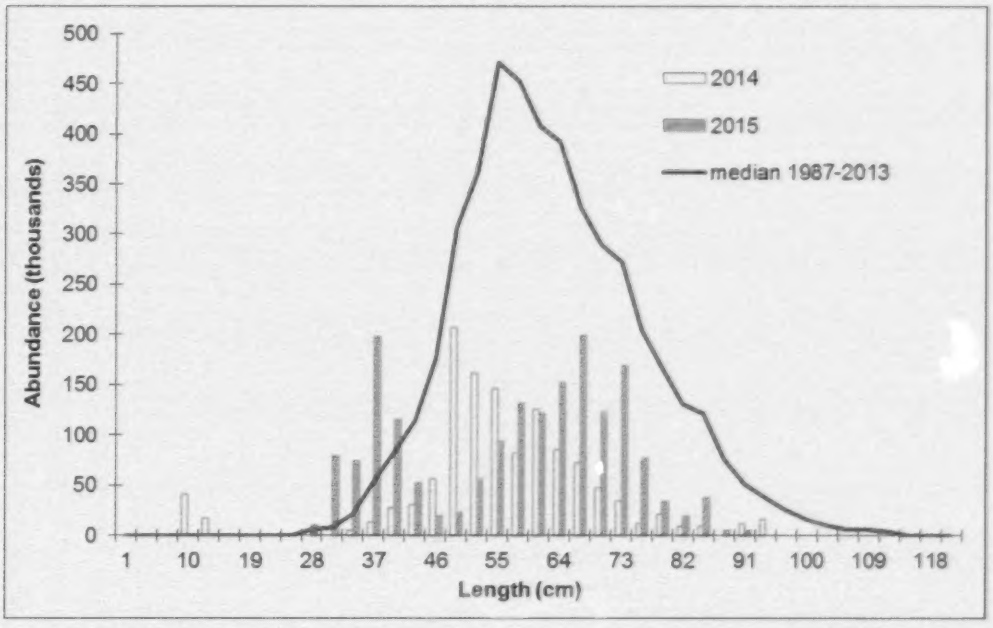


Figure 3c. Length frequency indices for Atlantic Cod in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median number in thousands at length for the time period 1987-2013.

Haddock

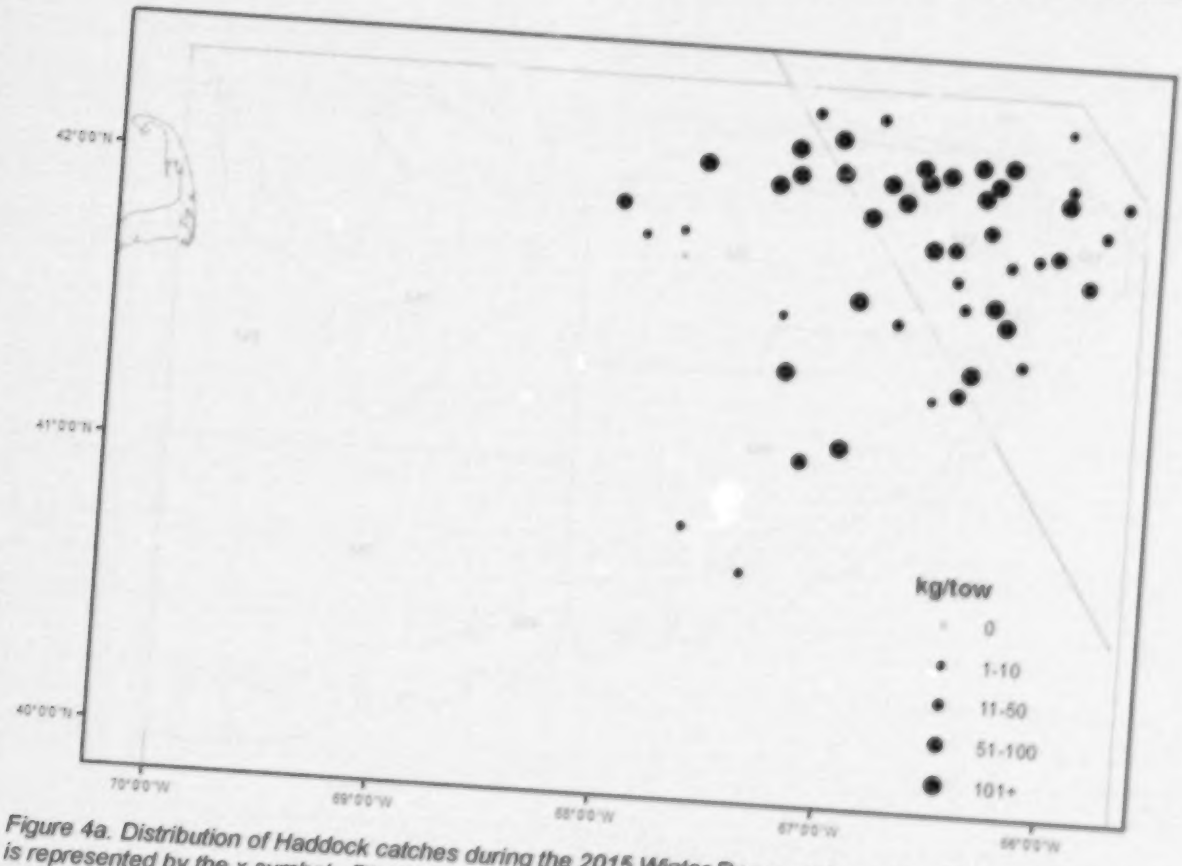


Figure 4a. Distribution of Haddock catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportional to the catch size.

Figure 4b. Biomass index for Haddock in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

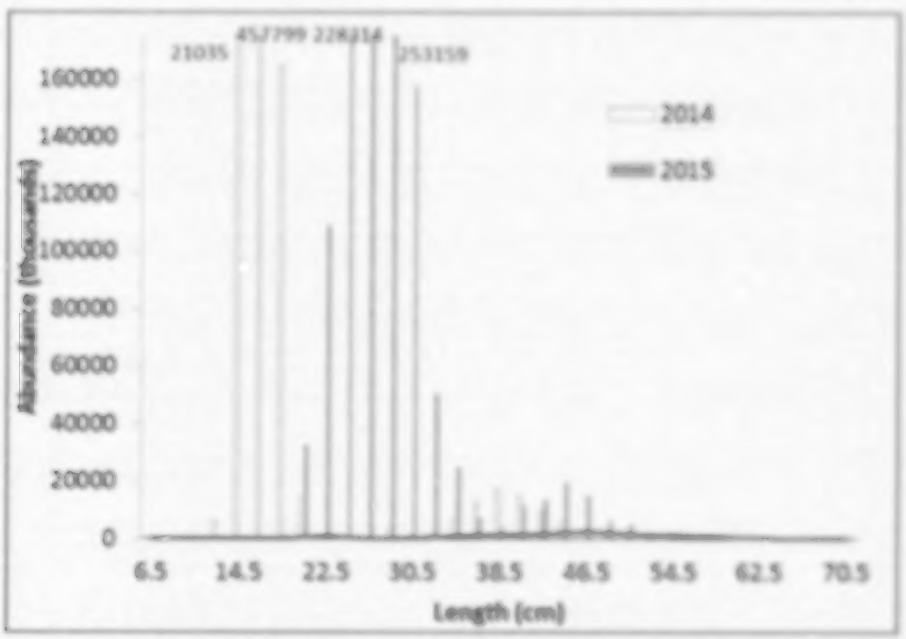


Figure 4c. Length frequency indices for Haddock in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median number in thousands at length for the time period 1987-2013.

Pollock

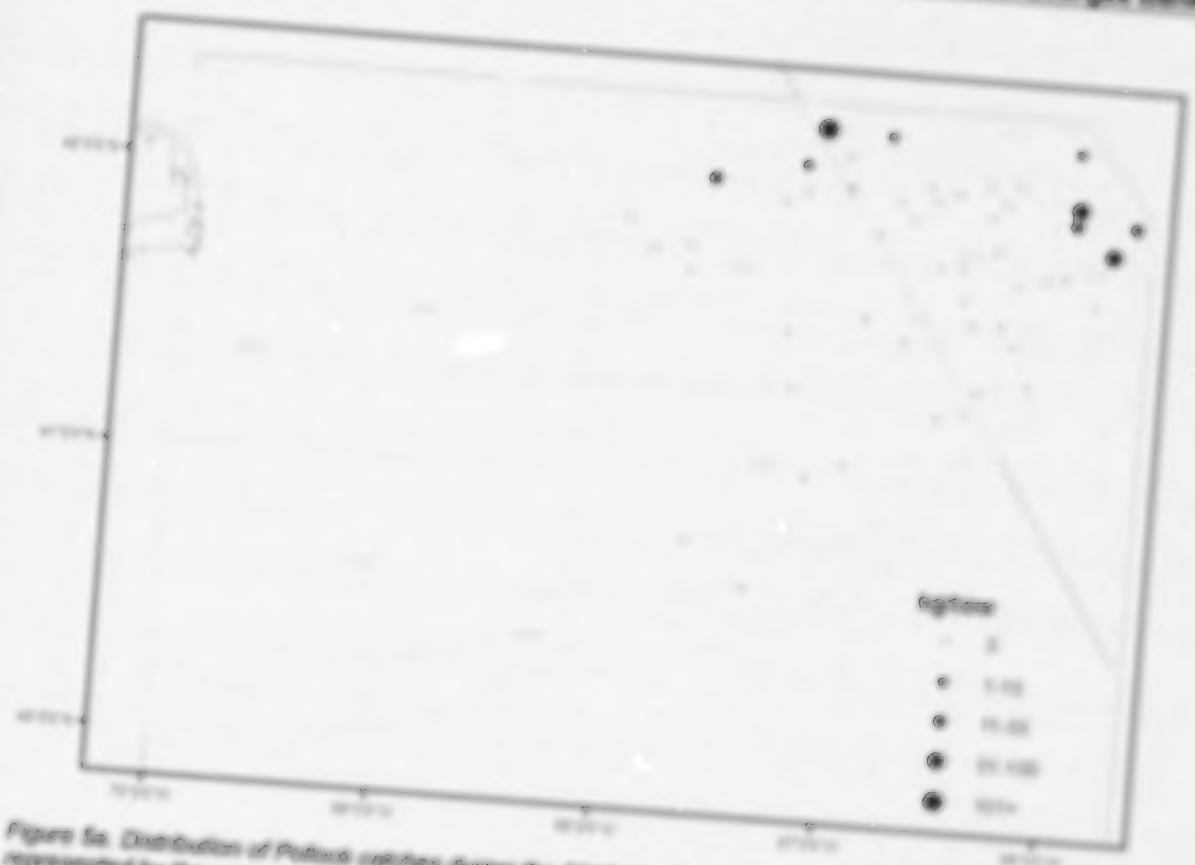


Figure 5a. Distribution of Pollock catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportional to the catch size.

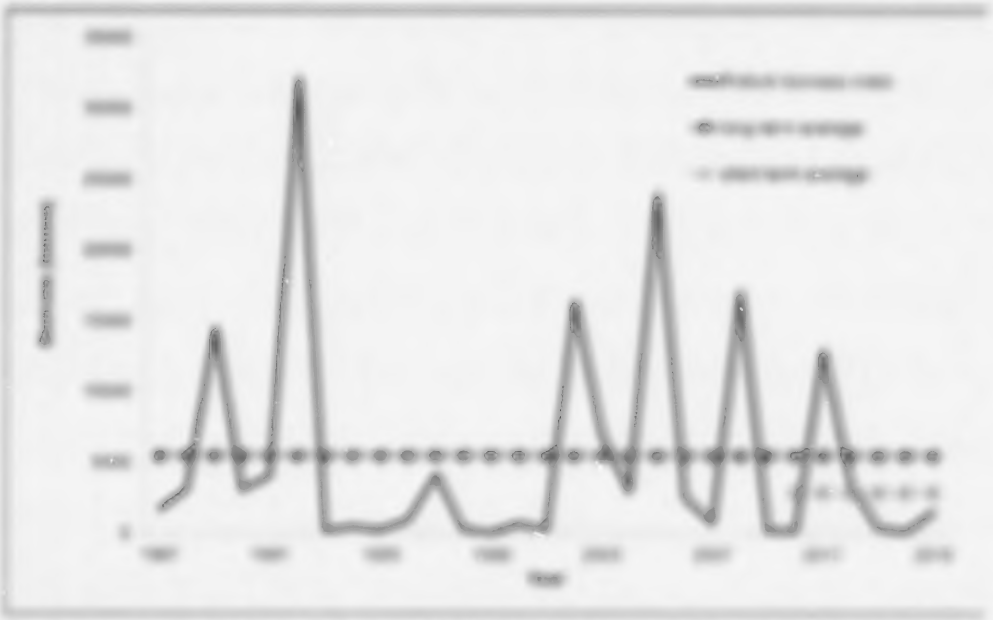


Figure 6b. Biomass index for Pollock in strata 521-523 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

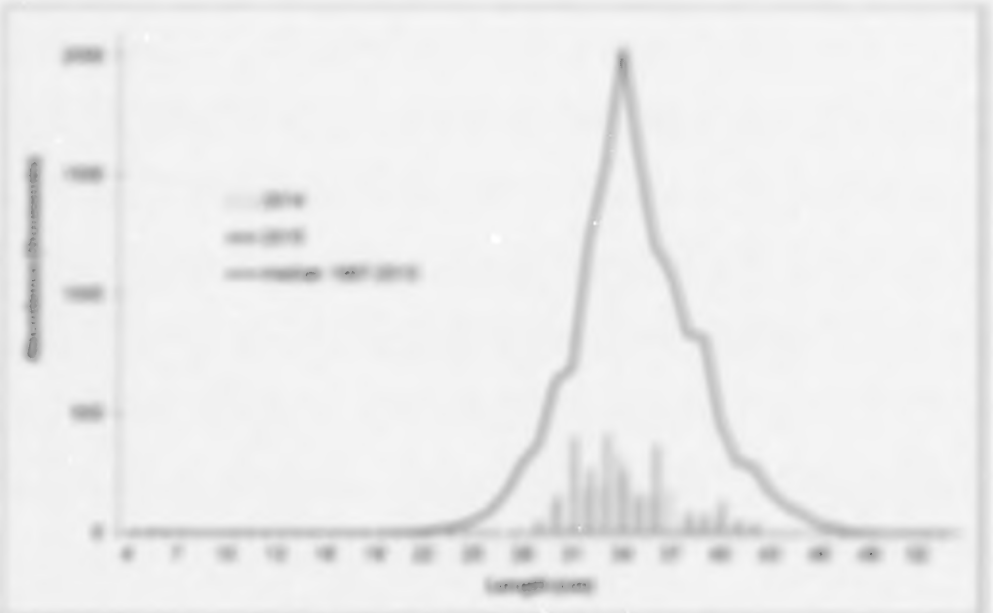


Figure 6c. Length frequency indices for Pollock in strata 521-523 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median number in thousands at length for the time period 1987-2013.

Whole Hake

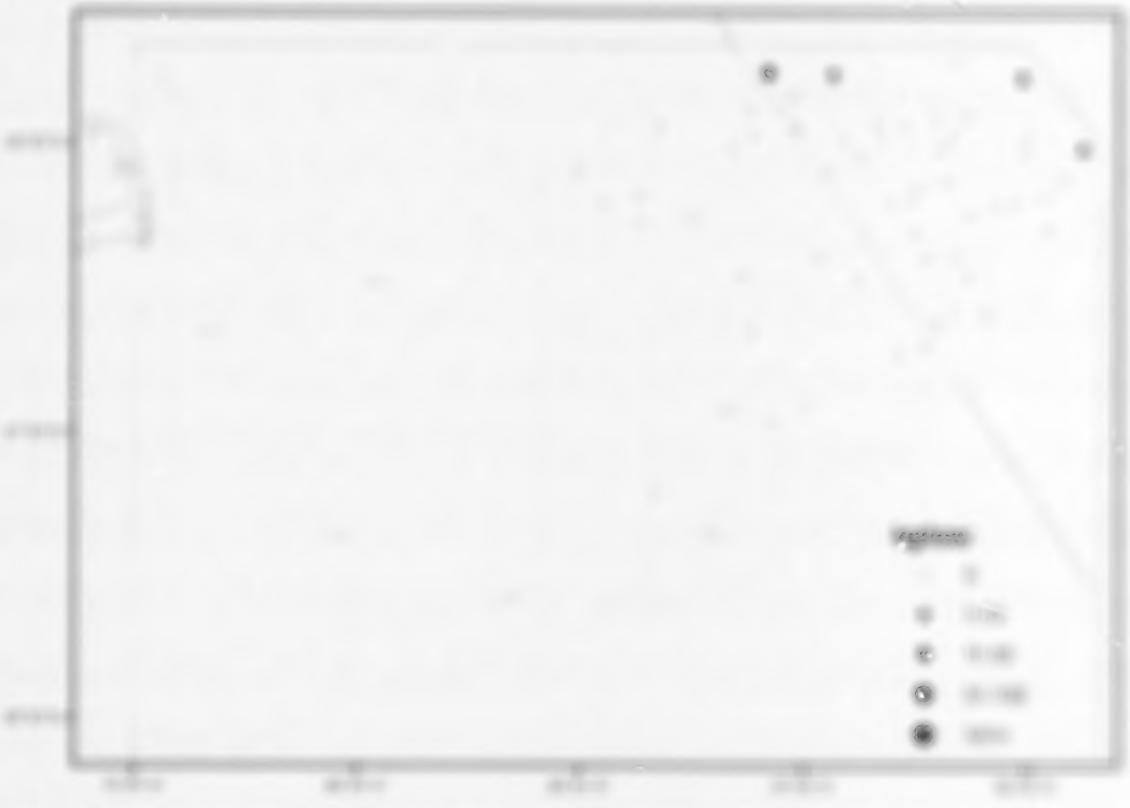
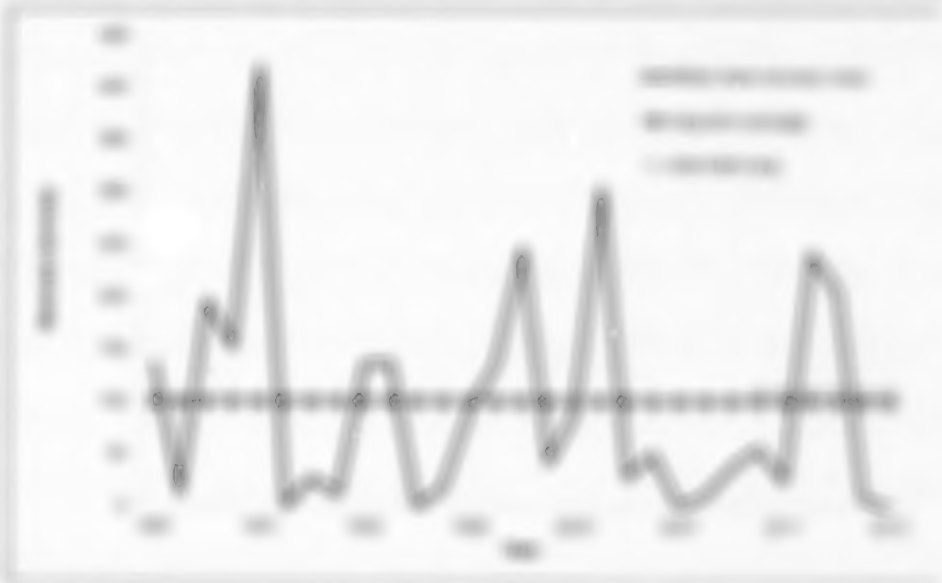
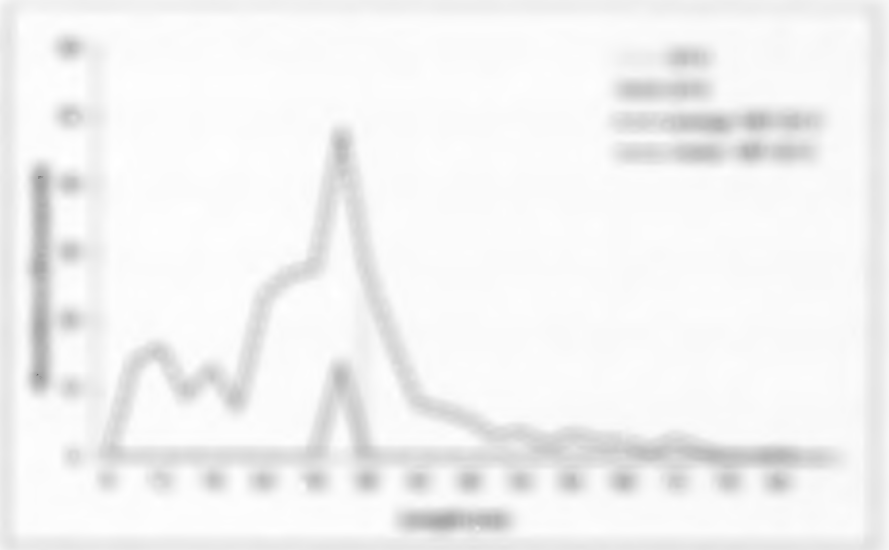


Figure 6b. Distribution of Whole Hake catches during the 2019 Winter Research Vessel (RV) Survey. Each catch is represented by the + symbol. Black circles represent catches. The circle size is proportional to the catch size. Note: Whole Hake were not caught in strata 621-625 during the 2019 Winter RV Survey.





Indianapolis Accessible

Figure 7.6. Distribution of Yellowtail Rockfish catches during the 2018 Alaska Groundfish Survey. Size of each circle is proportional to the number of catches. Black circles represent catches. The 200 m depth contour is shown.

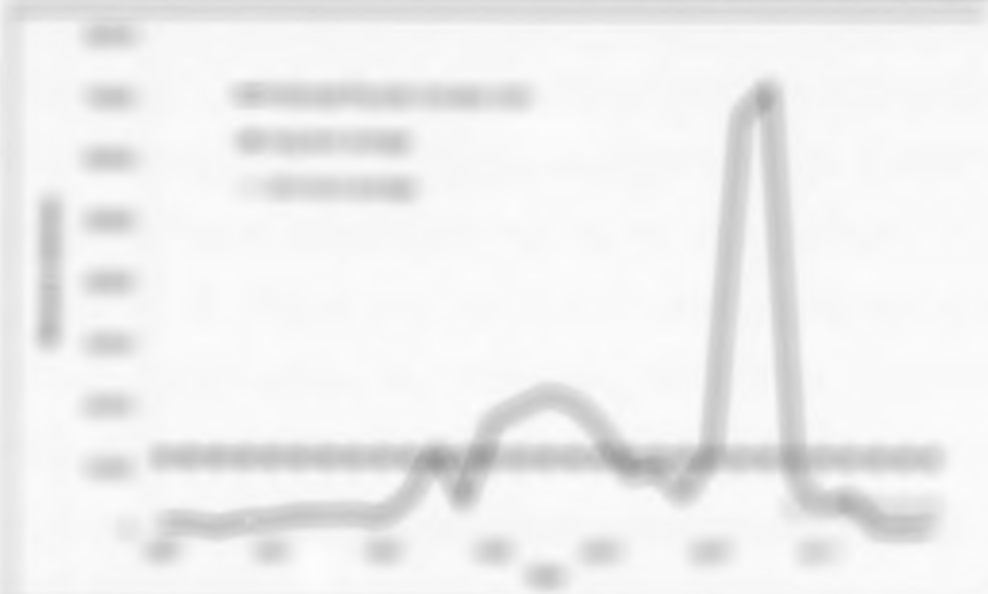


Figure 14 - Monitor view of Managed Storage in case of full disk error when Storage Account is not configured as an Availability Set. Note the 100% of disk queue length in the middle of the image. After that, the disk queue length drops to 0 and the Storage Account is unavailable.

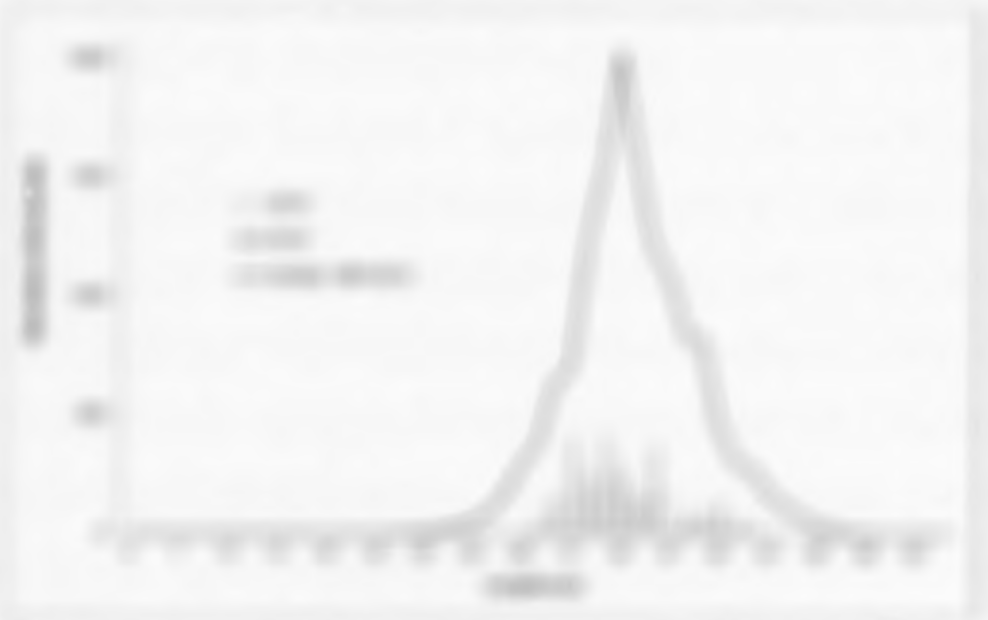


Figure 15 - Azure Diagnostics tables for a Managed Storage in case of full disk error when Storage Account is not configured as an Availability Set. Note the 100% of disk queue length in the middle of the image. After that, the disk queue length drops to 0 and the Storage Account is unavailable.

Smooth Skate

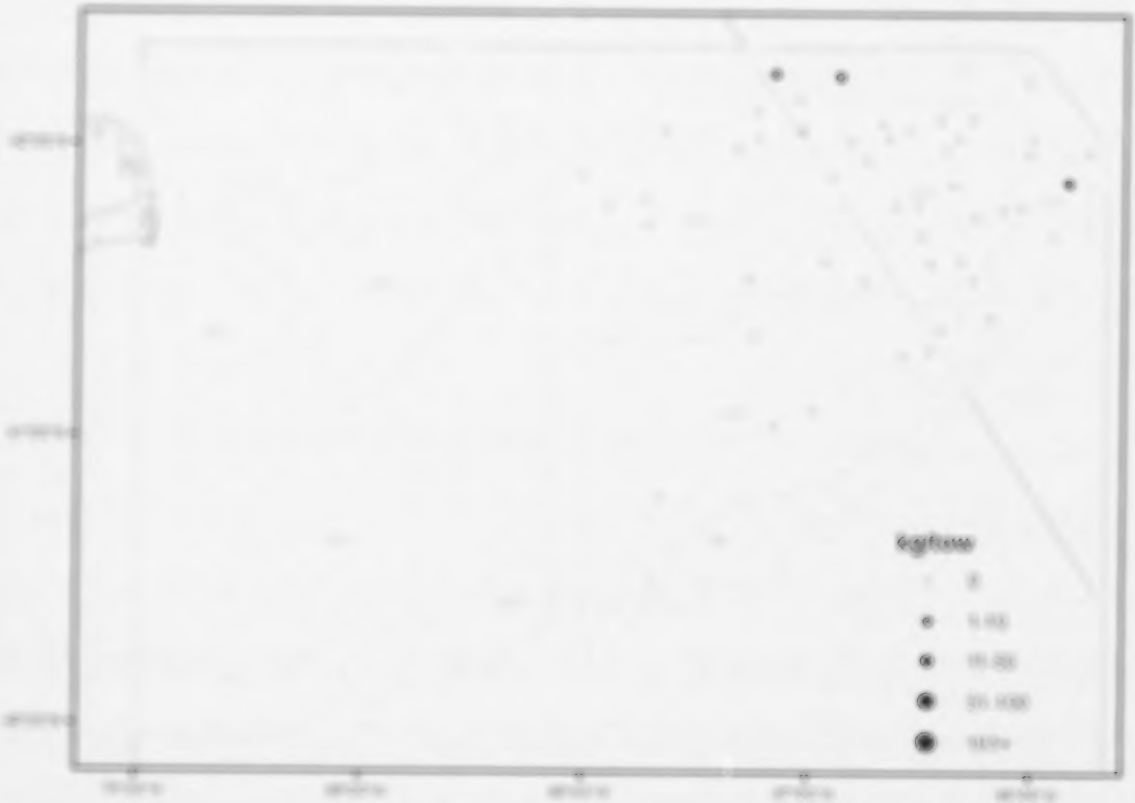


Figure 6a. Distribution of Smooth Skate catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

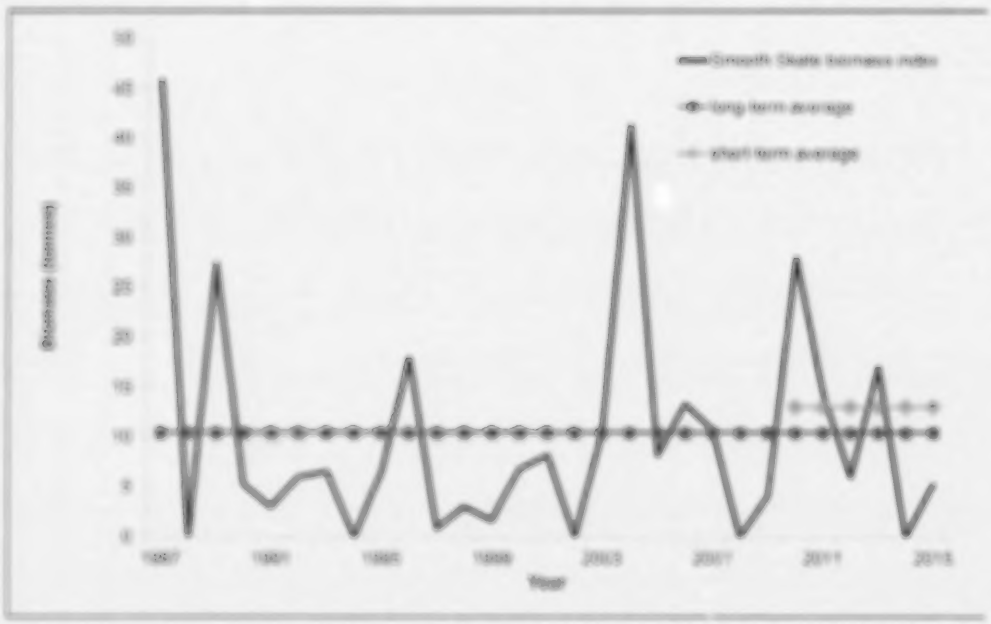


Figure 6b. Biomass index for Smooth Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

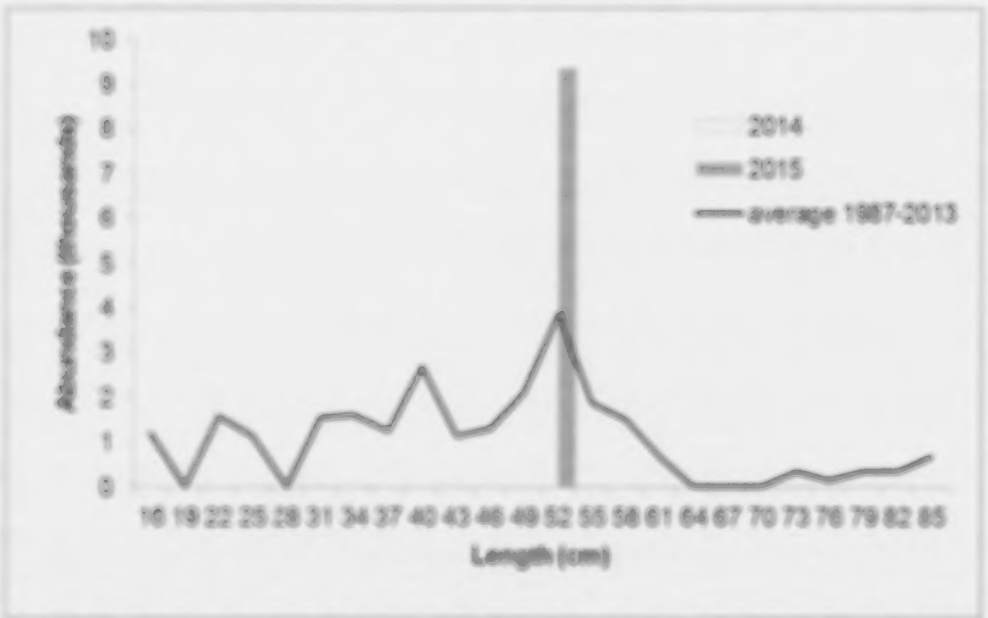


Figure 6c. Length frequency indices for Smooth Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the average number in thousands at length for the time period 1987-2013.

Thorny Skate

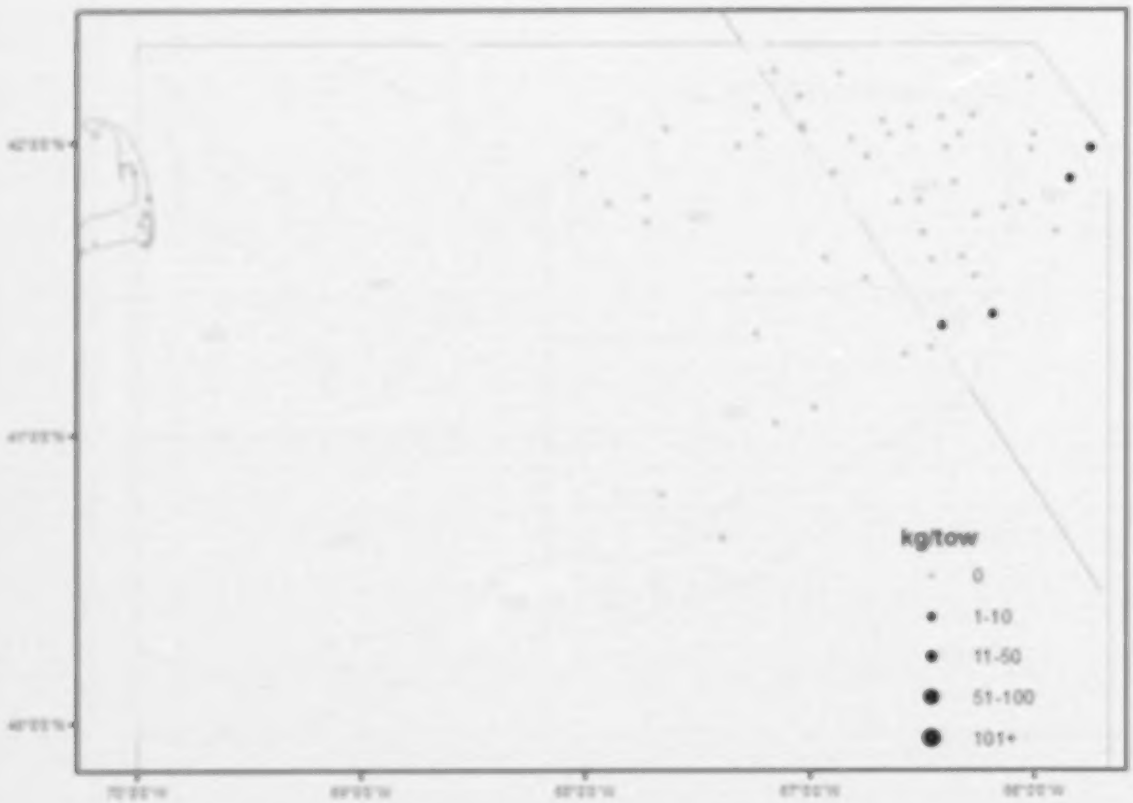


Figure 9a. Distribution of Thorny Skate catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportional to the catch size.

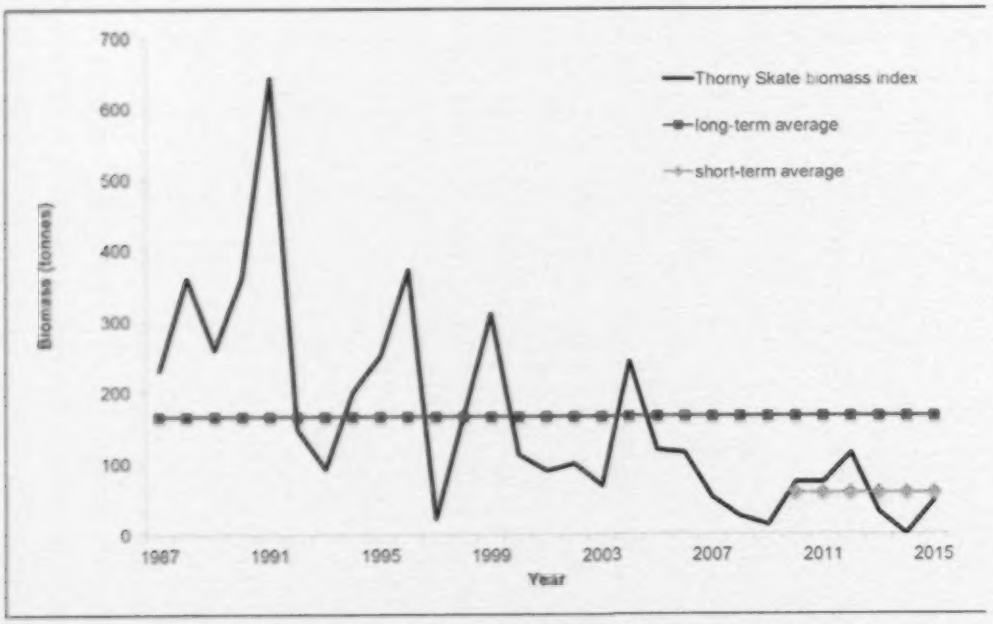


Figure 9b. Biomass index for Thorny Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

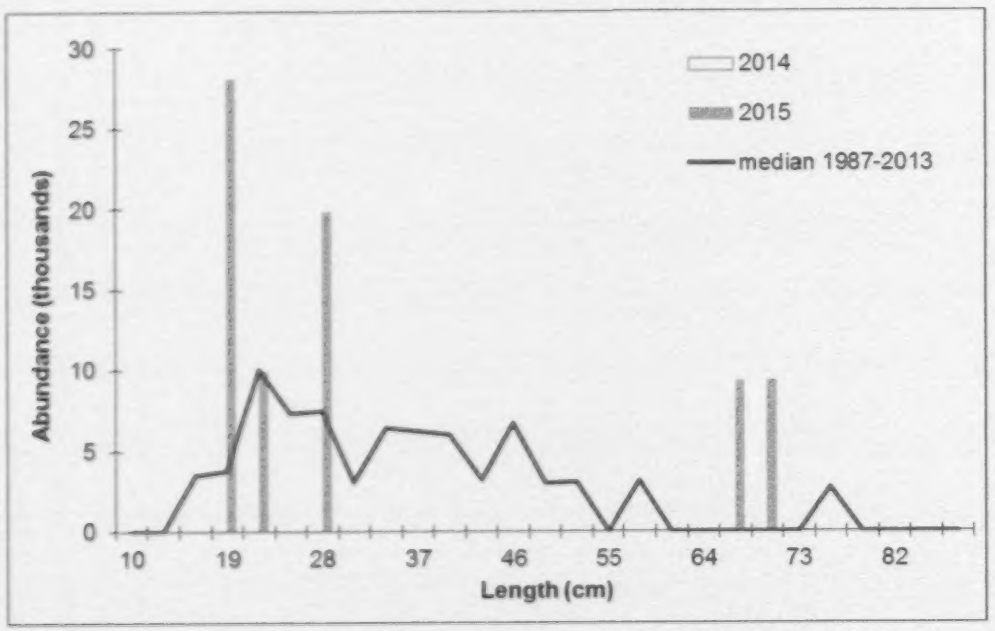


Figure 9c. Length frequency indices for Thorny Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median number in thousands at length for the time period 1987-2013.

Barndoor Skate

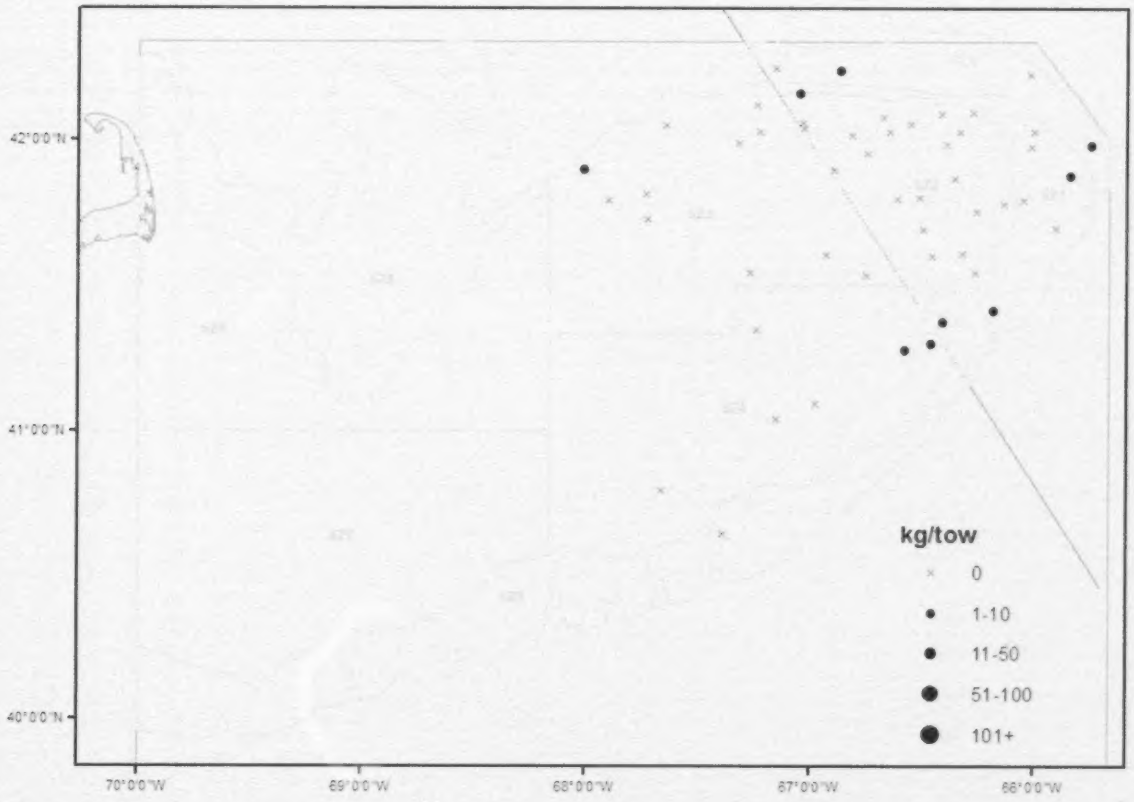


Figure 10a. Distribution of Barndoor Skate catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportional to the catch size.

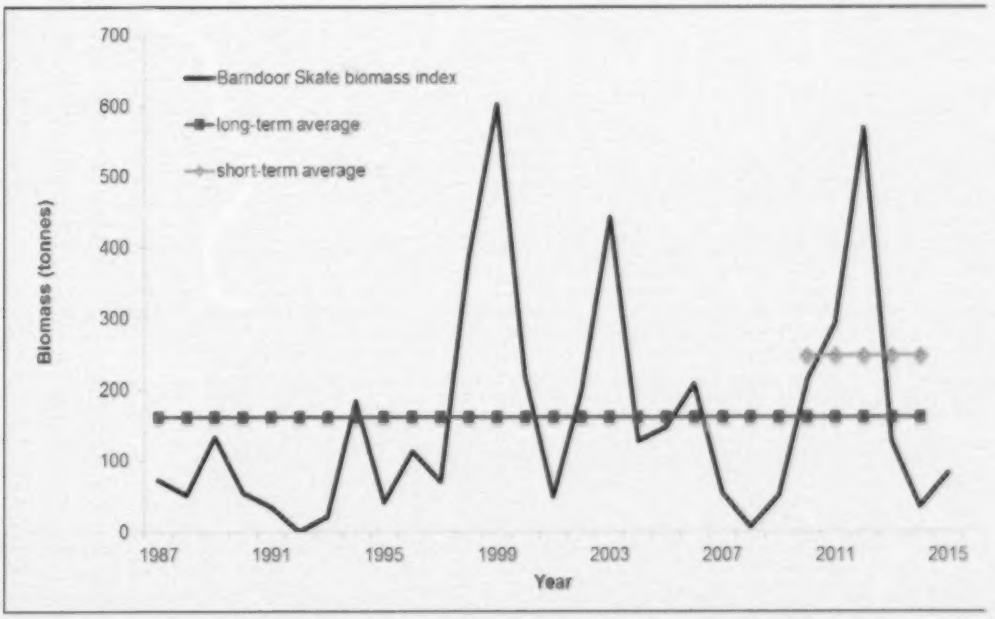


Figure 10b. Biomass index for Barndoor Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

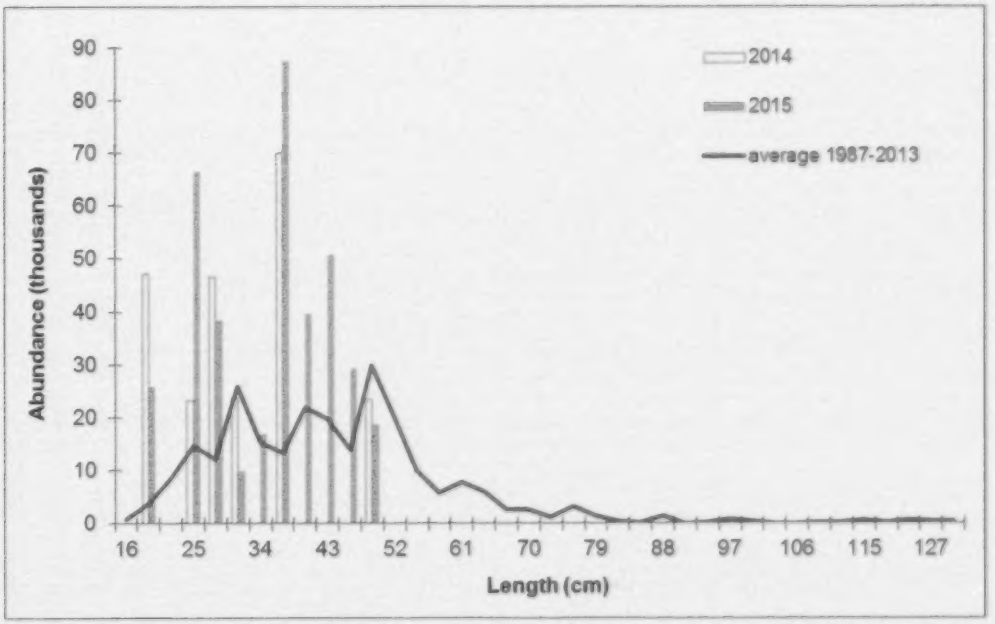


Figure 10c. Length frequency indices for Barndoor Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the average number in thousands at length for the time period 1987-2013.

Winter Skate and **Little Skate** cannot be reliably distinguished at lengths less than about 40 cm. Given that the majority of the Winter and Little skates captured in the surveys are in this length range, the biomass trends are influenced by the contribution of fish for which identification is uncertain (for more information see McEachran and Musick 1973).

Winter Skate

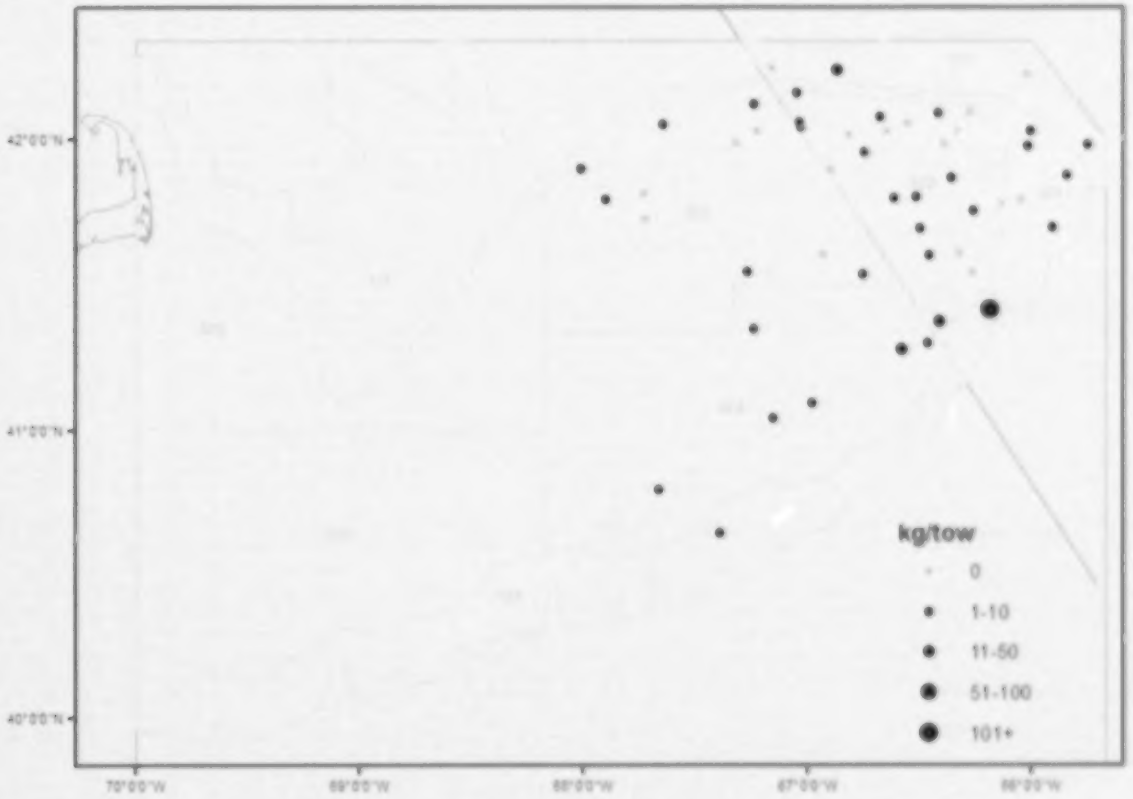


Figure 11a. Distribution of Winter Skate catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the x symbol. Black circles represent catches. The circle area is proportionel to the catch size.

Figure 11b. Biomass index for Winter Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

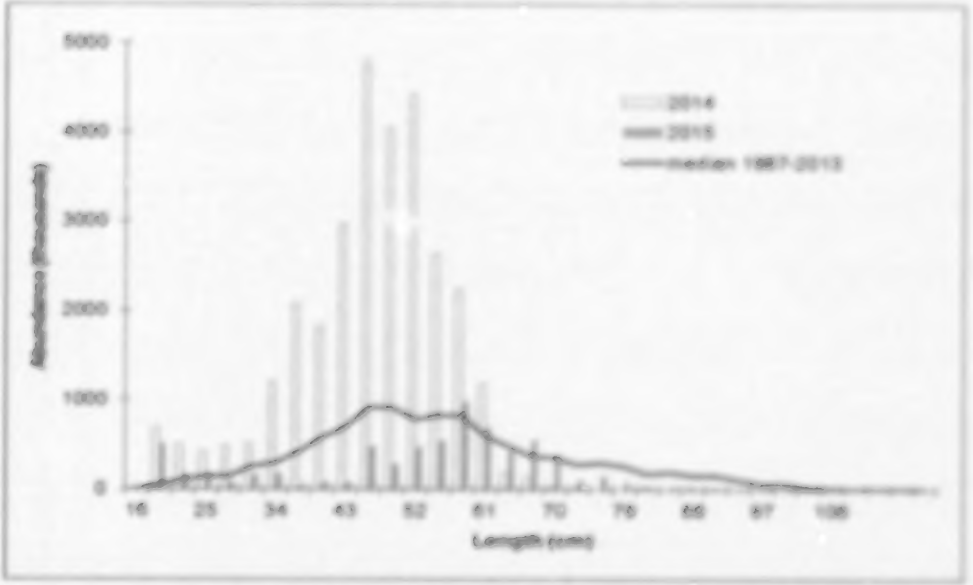


Figure 11c. Length frequency indices for Winter Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median number in thousands at length for the time period 1987-2013. Winter Skate and Little Skate cannot be reliably distinguished at lengths less than about 40cm. Standard practice at sea has been to include small undifferentiated skates as Winter Skate.

Little Skate

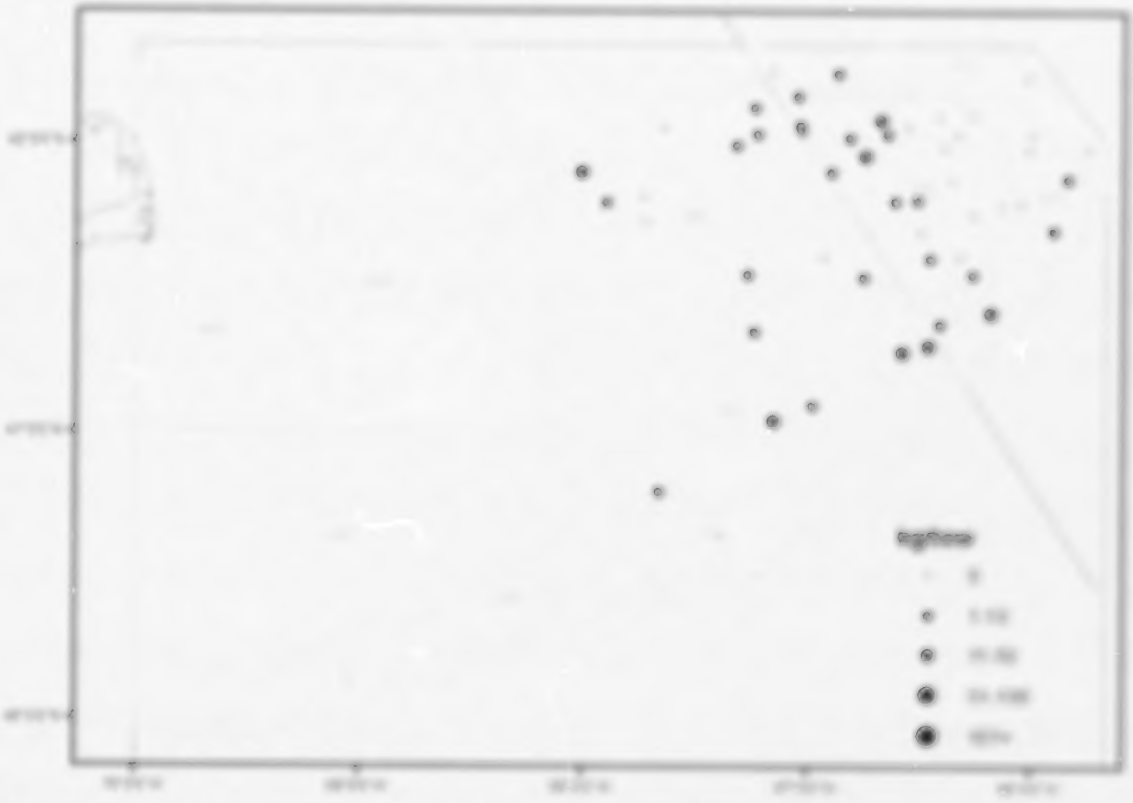


Figure 12a. Distribution of Little Skate catches during the 2015 Winter Research Vessel Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

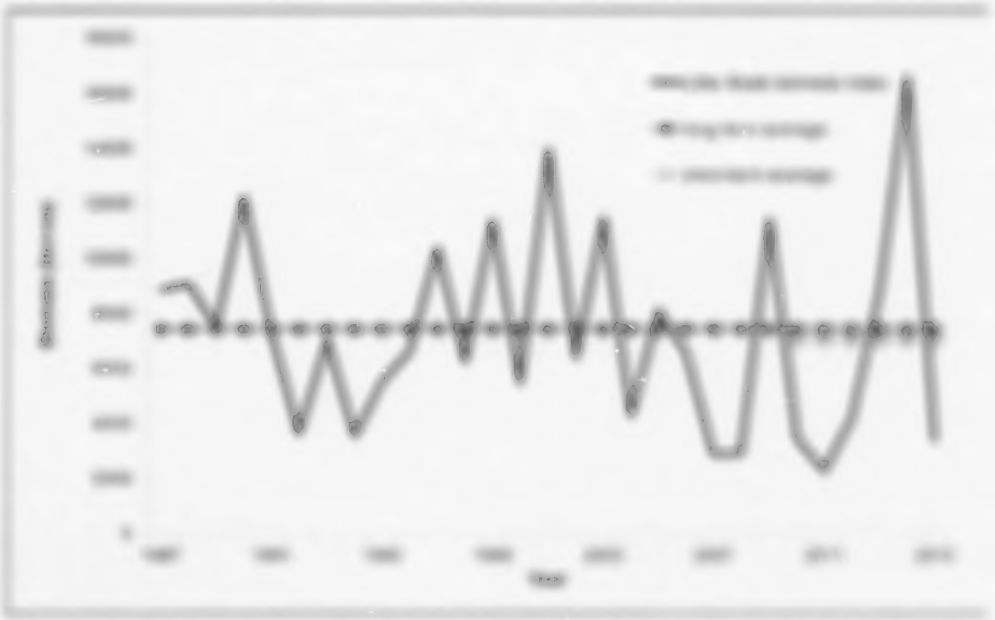


Figure 12b. Biomass index for Little Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey represented by the solid black line. The blue line with the blue squares represents the long-term survey average (1987-2014). The red line with the red diamonds represents the short-term 5 year average (2010-2014).

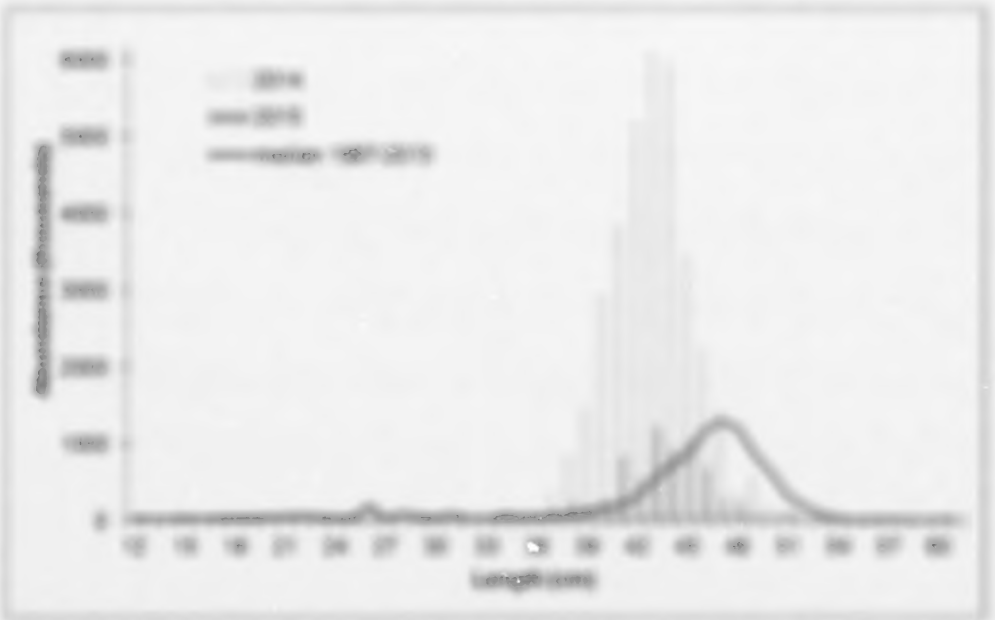


Figure 12c. Length frequency indices for Little Skate in strata 5Z1-5Z4 from the Winter Research Vessel Survey. The solid red bars represent the number in thousands at length from the 2015 survey. The open green bars represent the number in thousands at length from the 2014 survey. The solid blue line represents the median in thousands at length for the time period 1987-2015.

Conclusions

Biomass indices from strata 521-524 from the 2015 Winter RV Survey on Georges Bank were below the short term (2010-2014) and long term (1987-2014) average indices for all species reviewed in this report, with the exception of Haddock. Haddock was just above both short and long term averages.

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Date: January 11, 2016

Sources of Information

McEachran, J.D., and J.A. Musick. 1975. Characters for Distinguishing Between Immature Specimens of the Sibling Species, *Raja eglanteria* and *Raja ocellata* (Pisces: Rajidae). Copeia 1975: 258-263.

Stone, H.H., and N.E. Gross. 2012. Review of the Georges Bank Research Vessel Survey Program, 1987-2011. Can. Manuscr. Rep. Fish. Aquat. Sci. 2995: vii + 69p.

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